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GB 0894742 A
GB 0616357 A

(58) Field of search

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FIG. 1

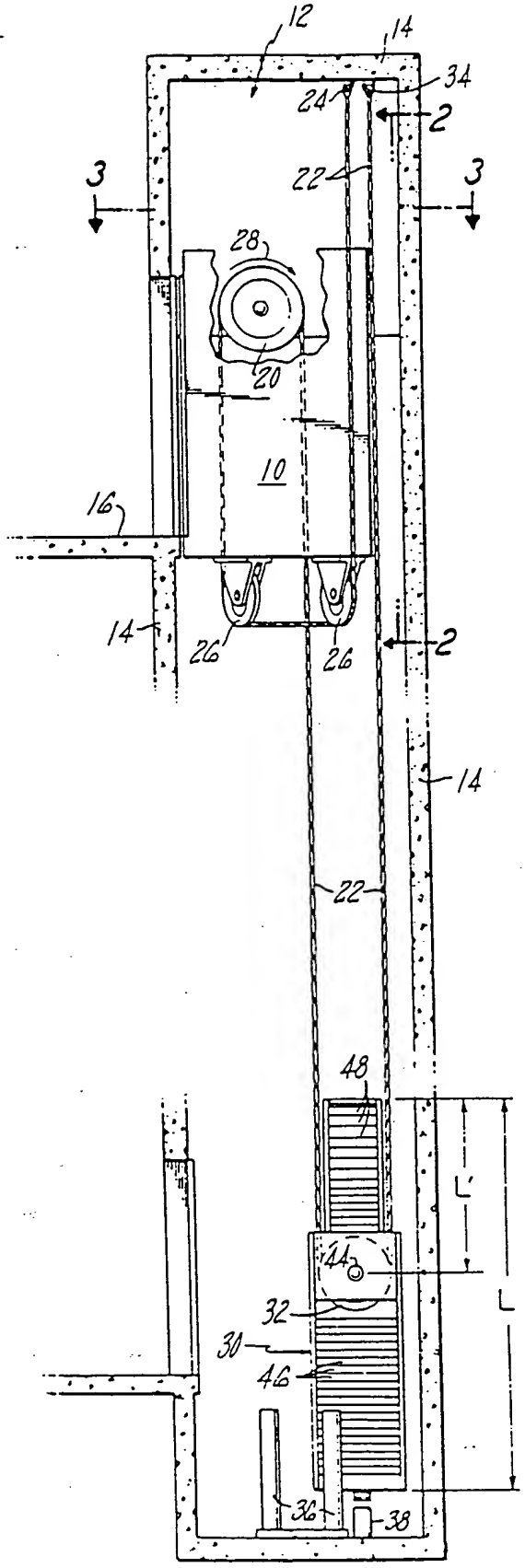
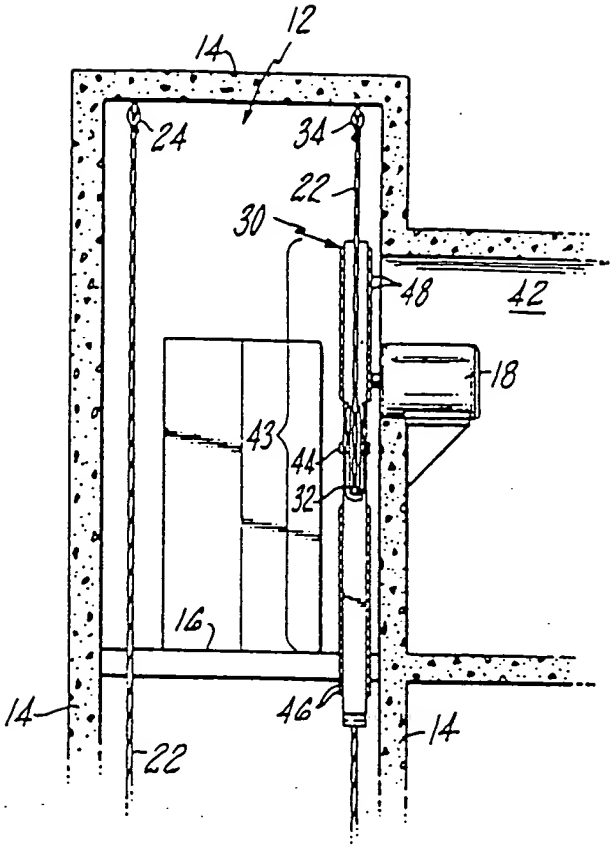


FIG. 2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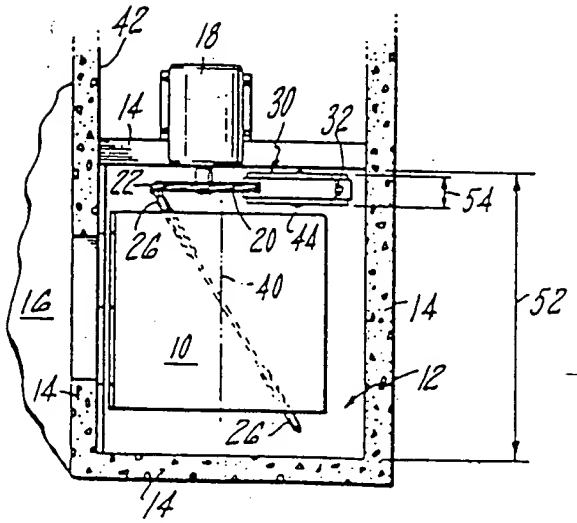
42
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FIG. 3

Elevator

This invention relates to elevators, and in particular, arrangements for propelling the counterweight in such elevators.

In a traction elevator, one end of each rope is attached to the counterweight, the other the car. The rope - actually a multistrand cable - rides in a groove on a sheave that is rotated by a motor to propel the car. In some traction elevators, however, the ropes are directed around sheaves to provide a mechanical advantage, for example 2:1, reducing the drive motor torque requirement. The ropes in one version are directed underneath the elevator car, extending from there to the motor, which is located at a position on the side of the shaft above the floor level at the top floor that is served by the car. The ends of each rope are "hitched"to the shaft wall.

The counterweight, which is usually in a range of 140-150% of the empty car weight, moves in the shaft with the car, and, so, sufficient width and length must be provided in the shaft for the counterweight, the elevator car, and the car guide rails.

In one broad aspect, the invention provides an elevator comprising an elevator car supported by a rope in a shaft, an elevator drive motor having a drive sheave engaged by the rope, and a counterweight supported by the rope at a point above the counterweight center of mass, with a substantial portion of the counterweight mass extending above the support point.

Viewed from another aspect the invention provides an elevator comprising an elevator car in a shaft, an elevator drive motor having a drive

sheave, at least one elevator rope secured at each end relative to the shaft, the rope extending from one secured end thereof around the bottom of the car and around the drive sheave, the rope extending from the drive sheave to support a counterweight and from the counterweight to its other end, wherein the counterweight is provided with a counterweight sheave which receives the rope and which is located above the counterweight center of mass, with a substantial portion of the counterweight mass extending above the sheave.

With such arrangements, the length of the counterweight portion which extends below the counterweight support point or sheave is reduced, enabling the depth of the shaft pit to be less. Further, by using the space above the counterweight support point or sheave to accommodate some of the counterweight mass, the width of the counterweight may be reduced to enable a reduction in the corresponding lateral dimension of the shaft.

Thus it is possible to minimize depth and size of the shaft, so that the shaft can be as small as possible.

A substantial portion of the counterweight's mass is located above the sheave, for example at least one quarter of the counterweight mass may be above the rotation axis of the counterweight sheave. This counterweight "upper portion" will preferably be located above the floor level of the top floor when the car is at the bottom of the shaft. The counterweight is preferably located on the same side of the shaft as the elevator drive motor; the motor is preferably also above the floor level of the top floor, but on the side of the shaft. Thus no machine room above the roof is required.

A preferred embodiment of the invention will now be described by way of example and with reference to the accompanying drawings in which:-

Fig. 1 is an elevation of the simplified elevator.

Fig. 2 is a side elevation of the top floor as seen in the direction 2 in Fig. 1.

Fig. 3 is a plan view at the line 3-3 in Fig. 1 looking down the shaft.

In Fig. 1, an elevator car 10 moves in an elevator shaft 12, defined by the walls 14. The car 10 is located at the top floor 16. The car is connected to a drive motor 18 (see Fig. 3) which rotates a drive sheave 20. An elevator rope or cable 22 is attached ("hitched") to the shaft wall at point 24, from which it extends down and underneath the bottom of the car 10; then through two opposed sheaves 26 back up to the sheave 20 and then in an arc 28 around the sheave, then down to the elevator counterweight 30, which is located in the bottom of the shaft. At the counterweight, the rope 22 extends around a counterweight sheave 32, returning from that sheave 32 to a hitch point 34 on the shaft wall. The car and counterweight are roped 2:1.

At the bottom of the shaft 12 are two elevator car buffers 36 and a counterweight buffer 38. These buffers are hydraulic devices that progressively slow the car or the counterweight when they are engaged only during emergency operations or buffer tests.

Referring for the moment to Fig. 3, it can be seen there that the rope 22 extends diagonally along the bottom of the car 10, and that the two sheaves 26 are located on opposite sides of the car's center of gravity, e.g., along line 40, which may be somewhat off the geometric center due to the weight of the door operators, which are well known and not shown.

In Fig. 2, the counterweight 30 is shown at the position at which it is placed when the

car 10 is at the bottom of the shaft: at the top of the shaft. It should be noted from Fig. 2 that a substantial portion 43 of the counterweight is above the level of floor 16. This occurs because the motor 18 is located in the machine room 42, which is above the level of floor 16, and because the rope 22 extends under the car.

As Fig. 1 shows, the counterweight sheave 32 is located in the middle of the counterweight, and for stability its rotational axis 44 should be above the counterweight center of mass. However, a substantial portion of the counterweight mass is located above point 44. Or, to put it another way, assuming that the counterweight has a certain length L, and a length L' of the counterweight is above the point of rotation 44, the length L' may be approximately one quarter to as much as one-third of the length L. This mass/length relationship is dependent on the distribution of the mass of the counterweight. In Fig. 1, the counterweight consists of removable blocks 46 of iron, even concrete, and the blocks 48 above the sheave 32 are not as wide as the other blocks 46, thereby accommodating entry and exit of the rope 22 to and from the counterweight sheave 32.

The advantage of this arrangement is that part of the counterweight mass that would normally be located below the sheave 32 may be located above the sheave because there is space above floor 16 that it can occupy when the car is at the bottom of the shaft. Fig. 3 aids in appreciating this; it shows that the counterweight 30 is located adjacent to the motor 18. Thus when the car is at the lowest position in the shaft, the upper portion, e.g., portion 43, of the counterweight is placed next to the sheave 20 on the motor and above the floor level. Due to this, the depth of the pit area may be less, and also the shaft width 52 may be

considerably less, because the width 54 of the counterweight may be reduced and because the same counterweight mass can be included in the elevator simply by extending a portion of the mass above the sheave 32.

In view of the foregoing discussion, one skilled in the art may make various modifications and alterations to the invention as described herein both in its broad terms and its specific embodiment without departing from the scope of this disclosure.

CLAIMS:

1. An elevator comprising an elevator car in a shaft, an elevator drive motor having a drive sheave, at least one elevator rope secured at each end relative to the shaft, the rope extending from one secured end thereof around the bottom of the car and around the drive sheave, the rope extending from the drive sheave to support a counterweight and from the counterweight to its other secured end, wherein the counterweight is provided with a counterweight sheave which receives the rope and which is located above the counterweight center of mass, with a substantial portion of the counterweight mass extending above the sheave.

2. An elevator as claimed in claim 1, wherein the drive sheave is arranged to rotate in a plane parallel to one side of the car, the counterweight being located on the same side of the shaft as the motor with the counterweight sheave arranged to rotate coplanar with or in a plane parallel to the drive sheave.

3. An elevator as claimed in claim 1 or 2, wherein the counterweight sheave is located within the interior of the counterweight such that the portion of the counterweight mass above said sheave is located between those parts of the rope which extend upwardly from the counterweight sheave.

4. An elevator as claimed in claim 1,2 or 3, wherein a portion of the counterweight mass extends above the bottom of the top floor of the shaft— when the car is at the bottom of the shaft.

5. An elevator as claimed in any preceding claim, wherein the drive motor is located adjacent the shaft below the top of the shaft, at a height such that when the car is at the top floor of the shaft, it extends above the motor.

6. An elevator as claimed in any preceding claim, wherein at least one quarter of the counterweight mass is above the rotation axis of the counterweight sheave.

7. An elevator comprising an elevator car supported by a rope in a shaft, an elevator drive motor having a drive sheave engaged by the rope, and a counterweight supported by the rope at a point above the counterweight center of mass, with a substantial portion of the counterweight mass extending above the support point.

8. An elevator substantially as hereinbefore described with reference to the accompanying drawings.